Peer Review
Experimental Toxicology Division
N H E E R L

Assessing the Potential Allergenicity of Biotechnology Products

MaryJane Selgrade and Marsha Ward

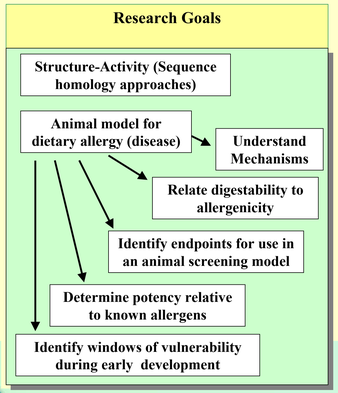
Introduction

Problem

- Biotechnology presents opportunity to improve crops through genetic engineering
  - productivity
  - nutritional value
  - resistance to pests and other stresses
- However, novel protein introduced into the environment (particularly the food supply) could be allergens
  - Could cause serious disease in susceptible individuals
  - Lack appropriate tools to assess risk

Risk:

- Food allergies are rare
  - Incidence about 5% children; 1-2% adults
  - 8 foods responsible for >90% allergies
- Influenced by
  - nature of protein
  - age & genetics
  - exposure conditions



Methods and Approach

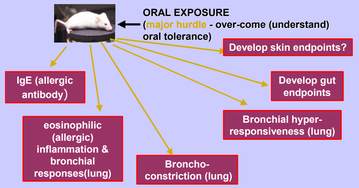
Annual Performance Goal

Improved capability to assess risks of allergenicity of GMOs (FY 08)

Annual Performance Measures

- In joint with NIEHS and FDA assemble expert panel to examine current state of knowledge, identify critical issues, & research needs - FY 03
- Develop models and methods for assessing potential allergenicity - FY 05
- Demonstrate the vulnerability of newborns & identify windows of vulnerability - FY 08

Adapting Rodent Model to Food Allergy

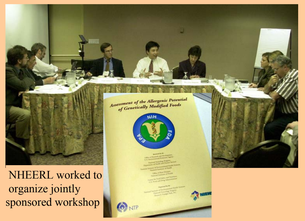


Two Potential Approaches to Overcome Oral Tolerance

- Sensitize very young animals (Holt et al)
- Use Cholera Toxin as an adjuvant at sensitization (Sampson et al)

Results

Partnering with NIEHS and FDA



NHEERL worked to organize jointly sponsored workshop

Workshop Developed list of Research Needs

- Develop, evaluate, & validate animal models
- Establish of clinically well-defined banks of human serum containing antibodies to allergens
- Improved human skin test technology
- Identify, purify, & bank both known protein allergens and of proteins believed not to be allergenic.
- Systematic recording of adverse events (case studies)
- Define relative potency & thresholds for sensitization & elicitation of allergic Rxs.
- Develop, refine, standardize, validate test protocols
- Study qualitative & quantitative relationships between antigen specific IgE & overt disease
- Investigate influence of route, duration, timing, & nature of exposure on development of sensitization.
- Study factors that contribute to susceptibility
- Investigate the mechanisms underlying food allergy
- Investigate potential windows of vulnerability during development
- Identify unique situations that cause children or other individuals to be at greater risk
- Establish the incidence of food allergy and whether it is changing.
- Study the potential role of non-IgE mediated reactions in food allergy

Published Product

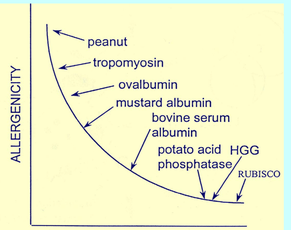
Volume 111 (8) June, 2003

Research Progress to Date

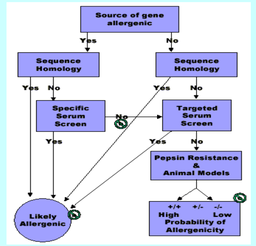
- Initiative for Biotech Research Funded FY04
- Postdoc recruitment under way (announcement closes October 31)

Impact

Relate allergenic potency of GMO proteins to that of common food proteins



Replace or Improve FAO/WHO Decision Tree



Future Directions

THE FUTURE IS NOW

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY